Naval Education and Training Command

NAVEDTRA 82540-A
April 1995
0503-LP-480-8100

Nonresident Training Course (NRTC)

Engineering Aid 1

Only one answer sheet is included in the NRTC. Reproduce the required number of sheets you need or get answer sheets from your ESO or designated officer.

The public wanting a copy of this document by following the purchasing instruction on the inside cover.

0503LP4808100

Although the words “he,” “him,” and “his” are used sparingly in this manual to enhance communication, they are not intended to be gender driven nor to affront or discriminate against anyone reading this material.

COMMANDING OFFICER
NETPDTC
6490 SAUFLEY FIELD RD
PENSACOLA, FL 32509-5237

ERRATA #1 03 Feb 98
Stock Ordering No.
0503-LP-480-8101

Specific Instructions and Errata for
Nonresident Training Course

ENGINEERING AID 1, NAVEDTRA 82540-A

1. No attempt has been made to issue corrections for errors in typing, punctuation, etc., that do not affect your ability to answer the question or questions.

2. To receive credit for deleted questions, show this errata to your local course administrator (ESO/scorer). The local course administrator is directed to correct the course and the answer key by indicating the question(s) deleted.

3. Assignment Booklet, NAVEDTRA 82540-A.

Delete the following questions, and leave the corresponding spaces blank on the answer sheets:

Questions

1-52

2-25

2-26

ENGINEERING AID 1
NAVEDTRA 82540-A

Prepared by the Naval Education and Training Program Management Support Activity, Pensacola, Florida

Congratulations! By enrolling in this course,you have demonstrated a desire to improve yourself and the Navy. Remember, however, this self-study course is only one part of the total Navy training program. Practical experience schools, and selected reading, and your desire to succeed are also necessary to successfully round out a fully meaningful training program. You have taken an important step in self-improvement Keep up the good work..

HOW TO COMPLETE THIS COURSE SUCCESSFULLY

ERRATA: If an errata comes with this course, make all indicated changes or corrections before you start any assignment. Do not change or correct the Training Manual (TRAMAN) or assignments in any other way.

TEXTBOOK ASSIGNMENT: The TRAMAN for this course is *Engineering Aid: Intermediate /Advanced,* NAVEDTRA 12540. The TRAMAN pages that you are to study are listed at the beginning of each assignment. Study these pages carefully before attempting to answer the questions in the course. Pay close attention to the tables and illustrations because they contain information that will help you understand the text. Read the learning objectives provided at the beginning of each chapter or topic in the text and/or preceding each set of questions in the course. Learning objectives state what you should be able to do after studying the material. Answering the questions correctly helps you accomplish the objectives.

BLACK DOT INFORMATION: Black dots (●) may be used in the text and correspondence course to emphasize important or supplemental information and to highlight instructions for answering certain questions. Read these black dot entries carefully; they will help you answer the questions and understand the material.

SELECTING YOUR ANSWERS: After studying the TRAMAN, you should be ready to answer the questions in the assignment. Read each question carefully then select the BEST answer. Be sure to select your answer from the subject matter in the TRAMAN.You may refer freely to the TRAMAN and seek advice and information from others on problems that may arise in the course. However, the answers must be result of your own work and decisions. You are prohibited from referring to or copying the answers of others and from giving answers to anyone else taking the same course. Failure to follow these rules can result in suspension from the course and disciplinary action.

SUBMITTING COMPLETED ANSWER SHEETS: Complete all assignments as quickly as possible to derive maximum benefit from the course. As minimum, you must submit at least one assignment per month. This is a requirement established by the Chief of Naval Education and Training. Failure to meet this requirement could result in disenrollment from the course.

TYPES OF ANSWER SHEETS: If you are a U.S. Navy enlisted member on active duty or a drilling U.S. Naval Reserve enlisted member, you should use the answer sheet attached at the end of this course and follow the instructions in section A below. If you are an enlisted U.S. Naval Reserve member who is not attached to a drilling unit or if you are an

officer, a civilian, or a member of the U.S. Army, Air Force, Marine Corps, or Coast Guard, you should use the Automatic Data Processing (ADP) answer sheets included in the course package and follow the instructions in section B.

A. Manually Scored Answer Sheets

If you are a U.S. Navy enlisted member on active duty or attached to A U.S. Naval Reserve drilling unit, your course will be administered by your local command. You must use the answer sheet designed for manual scoring, NETPMSA form 1430/5, Stock Ordering Number 0502-LP-216-0100. You may get a supply of the forms from your Educational Services Officer (ESO) , or YOU may reproduce the one in the back of this course booklet. DO NOT USE THIS FORM FOR COURSES ADMINISTERED BY NETPMSA.

Recording Information on the Manually Scored Answer Sheets: As YOU complete each assignment, submit the completed answer sheet to your ESO for grading. You may submit more than one answer sheet at a time. Remember, you must submit at least one assignment each month.

Grading: Your ESO will grade each answer sheet and notify you of any correct answer. The passing score for each assignment is 3.2. If you receive less than 3.2 on any assignment, the ESO will list the questions you answered incorrectly and give you an answer sheet marked "RESUBMIT." you must redo the assignment and complete the RESUBMIT answer sheet. The maximum score you can receive for a resubmitted assignment is 3.2.

Course Completion: After you have submitted all the answer sheets and have earned at least 3.2 on each assignment, your command should give you credit for this course by making the appropriate entry in your service record.

Student Question: If YOU have questions concerning the administration of this course, consult your ESO.

B. ADP Answer Sheets

If you are an enlisted U.S. Naval Reserve member who is not attached to a drilling reserve unit or if you are an officer , a civilian, or a member of the U.S. Army, Air Force, Marine Corps, or Coast Guard,use the ADP answer sheets provided in your course package. You should use one blank original ADP answer sheet for each assignment. Use only the original ADP answer sheet provided in your course package; NETPMSA will not accept reproductions.

Recording Information on the ADPAnswer Sheets: Follow the "MARKING INSTRUCTIONS" on each answer sheet. Be sure that blocks 1, 2, and 3 are filled in correctly.This information is necessary for your course to be properly processed and for you to receive credit for your work.

As you work the course, be sure to mark your answers in the course booklet because your answer sheets will not be returned to you. When you have completed an assignment, transfer your answer from the course booklet to the answer sheet.

Mailing the Completed ADP Answer Sheets: Upon completing an assignment, mail the completed answer sheet to:

COMMANDING OFFICER
NETPMSA CODE 074
6490 SAUFLEY FIELD RD
PENSACOLA FL 32559-5000

Use envelopes to mail your answer sheets. You must provide your own envelopes or request them from your ESO. You may enclose more than one answer sheet in a single envelope. Remember, reagardless of how many answer sheets you submit at a time, NETPMSA should receive at least one assignment a month.

NOTE: DO NOT USE THE COURSE PAGE AS AN ENVELOPE FOR RETURNING ANSWER SHEETS OR OTHER COURSE MATERIALS.

Grading: NETPMSA will grade the answer sheets and notify you by letter concerning your grade for each assignment, your incorrect answers, and your final grade. The passing score for each assignment is 3.2. If you receive less than 3.2 on any assignment, you must rework the assignment. NETPMSA will enclose a new ADP answer sheet in the letter notifying you of the questions you answered incorrectly. You will be required to redo the assignment and resubmit the new answer sheet. The maximum score you can receive for a resubmitted assignment is 3.2.

Course Completion: When you complete the last assignment, fill out THE "Course Completion" form in the back of the course and enclose it with your last answer sheet. NETPMSA will issue you a letter certifying that you satisfactorily completed the course. You should make sure that credit for the course is recorded in your service record. YOU MAY RETAIN THE TEXT.

NOTE: YOUR OFFICIAL COURSE COMPLETION DATE WILL BE THE DATE YOUR LAST ASSIGNMENT IS PROCESSED THROUGH THE NETPMSA ADP SYSTEM--NOT THE DATE YOU DEPOSIT THE LAST ASSIGNMENT IN THE MAIL. This is especially important if you are taking the course for Naval Reserve retirement credit. You must mail your answer sheets at least 60 days before your anniversary date. This will provide you with enough time for delays in the mail or reworking failed assignments. DO NOT MAIL YOUR ASSIGNMENTS TO THE NAVAL RESERVE PERSONNEL COMMAND (NRPC).

Student Question: Refer questions concerning this course to NETPMSA by mail (use the address on page ii) or by telephone:DSN 922-1366 or commercial (904) 452-1366.

NAVAL RESERVE RETIREMENT CREDIT

If you are a member of the Naval Reserve, you will receive retirement points if you are authorized to receive them under current directives governing retirement of Naval Reserve personnel. For the purpose of Naval Reserve retirement, this edition of the course is evaluated at 8 points. These points will be credited to you upon your satisfactory completion of the entire course.

NOTE: YOUR OFFICIAL COURSE COMPLETION DATE WILL BE THE DATE YOUR LAST ASSIGNMENT IS PROCESSED THROUGH THE NETPMSA ADP SYSTEM--NOT THE DATE YOU DEPOSIT THE LAST ASSIGNMENT IN THE MAIL. Refer to the Course Completion paragraph under section B. ADP Answer Sheets.

COURSE OBJECTIVES

In completing this Nonresident Training Course (NRTC), you will demonstrate a knowledge of the subject matter by correctly answering questions on the following: Technical Administration; Field Astronomy and Triangulation; Soils: Surveying & Exploration /Classification/ Field Identification; Mix Design: Concrete & asphalt; and Soil Stabilization.

Naval courses may include several types of questions--multiple-choice, true-false, matching, etc. The questions are not grouped by type but by subject matter. They are presented in the same general sequence as the textbook material upon which they are based. This presentation is designed to preserve continuity of thought, permitting step-by-step development of ideas. Not all courses use all of the types of questions available. The student cart readily identify the type of each question, and the action required, by inspection of the samples given below.

MULTIPLE-CHOICE QUESTIONS

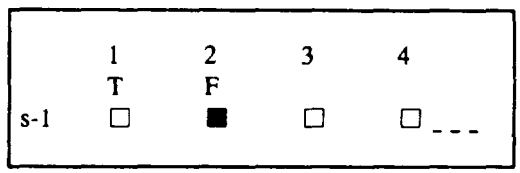
Each question contains several alternatives, one of which provides the best answer to the question. Select the best alternative, and blacken the appropriate box on the answer sheet.

SAMPLE

s-1. Who was the first person appointed Secretary of Defense under the National Security Act of 1947?

1. George Marshall
2. James Forrestal
3. Chester Nimitz
4. William Halsey

Indicate in this way on the answer sheet:



TRUE-FALSE QUESTIONS

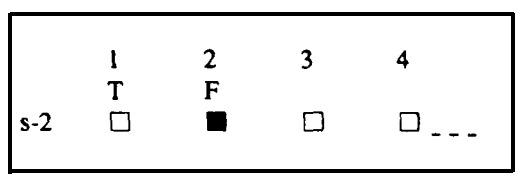
Mark each statement true or false as indicated below. If any part of the statement is false the statement is to be considered false. Make the decision, and blacken the appropriate box on the answer sheet.

SAMPLE

s-2. All naval officers are authorized to correspond officially with any systems command of the Department of the Navy without their respective commanding officer's endorsement.

1. True
2. False

Indicate in this way on the answer sheet:



MATCHING QUESTIONS

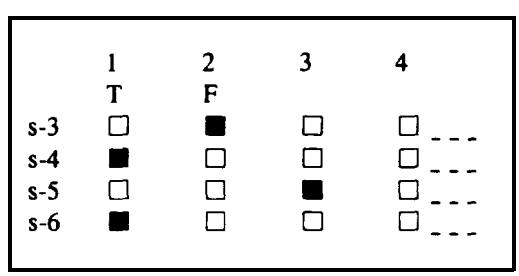
Each set of questions consists of two columns, each listing words, phrases or sentences. The task is to select the item in column B which is the best match for the item in column A that is being considered. Items in column B may be used once, more than once, or not at all. Specific instructions are given with each set of questions. Select the numbers identifying the answers and blacken the appropriate boxes on the answer sheet.

SAMPLE

In questions s-3 through s-6, match the name of the shipboard officer in column A by selecting from column B the name of the department in which the officer functions. Some responses may be used once, more than once, or not at all.

	A. OFFICER	B. DEPARTMENT
s-3.	Damage Control Assistant	1. Operations Department
s-4.	CIC Officer	2. Engineering Department
s-5.	Disbursing Officer	3. Supply Department
s-6.	Communications Officer	

Indicate in this way on the answer sheet:



ASSIGNMENT 1

Textbook Assignment: "Technical Administration and Supervision." Pages 14-1 through 14-14.
"Field Astronomy and Triangulation." Pages 15-1 through 15-24.

Learning Objective: Identify the duties and responsibilities of the EA supervisor in providing assistance to the management division of a battalion operations department.

1-1. Which of the following responsibilities applies to you, a supervisor, in an engineering department?

1. Making progress reports
2. Performing PRCP interviews
3. Carrying on a comprehensive training program
4. Each of the above

1-2. The management division of the operations department is also known as the

1. engineering division
2. administration division
3. quality control division
4. operations staff

1-3. Labor reports are used to accomplish which of the following purposes?

1. To compare actual performance with the estimated standards
2. To determine the effectiveness of labor utilization
3. To determine labor expenditures on projects
4. Each of the above

1-4. Man-days are computed on what time standard?

1. An 8-hour day
2. A 12-hour day
3. A 10-hour day
4. The scheduled battalion workday

1-5. Productive labor includes which of the following labor categories?

1. Overhead
2. Direct
3. Indirect
4. Both 2 and 3 above

1-6. Which of the following tasks is considered indirect labor?

1. Preparation of as-built drawings
2. Transit time to and from the jobsite
3. Concrete testing
4. Each of the above

1-7. The SITREP is transmitted in what format?

1. NAVGRAM
2. Message
3. Memorandum
4. Marsgram

1-8. What reference should you use for the SITREP format?

1. COMSECOND/COMTHIRDNCBINST 3121.1
2. COMSECOND/COMTHIRDNCBINST 5100.1
3. COMSECOND/COMTHIRDNCBINST 5200.2
4. COMSECOND/COMTHIRDNCBINST 6260.4

Learning Objective: Identify the duties and responsibilities of an EA supervisor for coordinating and supervising the activities of the engineering division of a battalion operations department.

1-9. In the absence of an EAC, the EA1 assumes which of the following responsibilities?

1. The duties of the engineering chief
2. The manager of the radiation safety program
3. Both 1 and 2 above
4. The duties of the training chief

1-10. What is the recommended interval for performing an inventory of the drafting kit?

1. Once a month
2. Twice a month
3. Every 3 months
4. Every 2 weeks

1-11. What person is normally held accountable for the tool kits?

1. The drafter
2. The engineering officer
3. The drafting supervisor
4. The supply petty officer

1-12. According to NAVFAC P-80, the drafting office should have what minimum space per drafter?

1. 75 square feet, including storage
2. 75 square feet, excluding storage
3. 90 square feet, including storage
4. 90 square feet, excluding storage

1-13. Whenever possible, the drafting equipment and reproduction equipment should be located in the same room.

1. True
2. False

1-14. What is the purpose of logging out prints?

1. To keep an accurate account of what project is using the most paper
2. To ensure unnecessary prints are not reproduced
3. To inform cognizant personnel of changes made to the drawings
4. All of the above

1-15. Which of the following considerations must be addressed first when setting up a reproduction room?

1. Storage
2. Air conditioning
3. Ventilation
4. Lighting

1-16. The publications required for the engineering technical library are listed in what reference?

1. NAVFAC P-315
2. NAVFAC P-437
3. NAVFAC P-349
4. TOA

1-17. NAVFAC publications and military handbooks are the only publications required for the engineering technical library.

1. True
2. False

1-18. When checking and editing drawings, what standard, if any, establishes the procedures that you should follow?

1. NAVFAC P-272
2. MIL-HDBK-1006/1
3. ANSI Y14 series
4. None

1-19. You should consult with the appropriate Seabee ratings when you encounter problems while reviewing drawings.

1. True
2. False

1-20. A newly reported EA should study which of the following publications to be proficient as a drafter?

1. NAVFAC P-437
2. MIL-HDBK-1006/1
3. MIL-STD-100E
4. All of the above

1-21. Which of the following supervisory responsibilities should be considered in making work assignments?

1. Awareness of the OCCSTDs for each paygrade
2. Knowledge of how the task is to be accomplished
3. Knowledge of each person’s capabilities
4. Both 2 and 3 above

1-22. The degree of explanation required for a work assignment depends on the experience of the drafter.

1. True
2. False

1-23. A work request serves which of the following purposes?

1. To account for requested work
2. To track work progress
3. To identify personnel shortages
4. To reflect priorities assigned by shop personnel

1-24. Which of the following engineering duties is performed by the field engineering section?

1. Obtaining as-built information
2. Making field compaction tests
3. Directing earthwork operations
4. Reproducing field prints

1-25. What is the first concern of a survey party chief when organizing survey crews?

1. The availability of transportation
2. The job completion deadline
3. The formulation of a job plan
4. The capabilities of personnel assigned

1-26. Of the following survey parties, which one affords the greater flexibility as to the number of personnel required?

1. Plane table
2. Stadia
3. Leveling
4. Reconnaissance

1-27. what type of sheet is used to record reduced field note data?

1. Bench mark
2. Abstract
3. Traverse
4. Base line

1-28. What person is responsible for error-free computations in field notes?

1. The party chief
2. The engineering officer
3. The supervisor
4. The note keeper

1-29. Which of the following methods helps to ensure that the calculations of the crew are correct?

1. Recheck all calculations
2. Spot-check calculations
3. Compute data by two different methods
4. Observe all calculations being performed

1-30. As a survey crew party chief, you must develop which of the following skills for use when checking field notes?

1. Weighing the results for the probability of error
2. Weighing the results for possible errors
3. Avoiding mistakes when you are making calculations
4. Spot-checking the calculations made by your crew members

1-31. To increase the motivation of a field crew, you must employ what technique?

1. Offer job rotation for the crew
2. Reduce competition among the crew
3. Keep the crew informed of the purpose of the task
4. Give them more free time to study the job assigned

1-32. When is the best time for a supervisor to conduct training for personnel assigned?

1. At the beginning of the workday
2. At the end of the workday
3. During designated training periods
4. Whenever the work load permits

1-33. What is the definition of combat intelligence?

1. Knowledge of the enemy, weather, and terrain necessary to plan and conduct tactical operations
2. Knowledge of enemy troop movements
3. A battalion operation order
4. Information about battalion capabilities

1-34. The materials testing section provides support for what division in the operations department?

1. Management
2. Field engineering
3. Quality control
4. Design

1-35. All work requests for the materials testing section are generated outside of the engineering department.

1. True
2. False

1-36. You are reviewing an in-place density test result. A great difference exists between the results and the expected results. What action should you take?

1. Have the EA that performed the test review the procedures as the test was obviously performed wrong
2. Rerun the test
3. Review the procedures and attempt to determine the cause of the discrepancy
4. Replace the EA assigned to the soils lab

1-37. Part of trainiq new personnel should encompass which of the following examples?

1. Have them work with experienced personnel
2. Explain the forms used locally
3. Have them practice the difficult tests under supervision
4. Each of the above

Learning Objective: Identify the systems of time used in field astronomy.

1-38. When the sun is in exact alignment with a particular meridian, what is the local apparent time?

1. 0600
2. 1200
3. 1600
4. 1800

1-39. What meridian is used as the center line of each time zone?

1. Meridians that are multiples of 7°30′
2. Meridians that are multiples of 15°
3. Longitudes that are multiples of 15°30′
4. Longitudes that are multiples of 7°30′

1-40. GMT is located

1. 0°
2. 15°E
3. 30°E
4. 60°W

1-41. When the time is 1220 at your location of 47°W, what is the time 44° west of you?

1. 0620
2. 0920
3. 1520
4. 1820

1-42. If you record the time incorrectly by 2 minutes, what type of plotting error is created?

1. 15´ in latitude
2. 15´ in longitude
3. 30´ in latitude
4. 30´ in longitude

1-43. If you are taking star shots in an area that is using daylight saving time, what compensation, if any, must be made?

1. Add 1 hour to your time
2. Deduct 1 hour from your time
3. Deduct 1 hour if it is a sun shot
4. None

Learning Objective: Identify given elements of field astronomy. Identify elements of the astronomical triangle.

1-44. Which of the following systems use astronomic determinations based on hour angle and declination?

1. Terrestrial
2. Horizon
3. Celestial
4. Lunar

1-45. The longitude of a point is the angular distance between the meridian at the point and the prime meridian.

1. True
2. False

1-46. Projections through the poles comparable to the meridians are known as

1. great circles
2. declinations
3. ascensions
4. hour circles

1-47. What is the declination of a celestial body?

1. The angular distance north or south from the celestial meridian
2. The angular distance north or south from the celestial equator
3. The angular distance east or west from the celestial meridian
4. The angular distance east or west from the celestial equator

1-48. Right ascension is normally expressed in

1. hours
2. minutes
3. degrees
4. miles

1-49. The correction for parallax, which must be made for precise computations, accounts for the

1. refraction of the rays of the sun
2. gravitational differential created by the direction of the plumb line
3. displacement of the horizon plane
4. elliptical variation of the surface of the earth

1-50. The side of the astronomical triangle between the pole and the star is known as the

1. colatitude
2. coaltitude
3. parallactic
4. codeclination

Learning Objective: Determine the celestial coordinate when given meridian altitude observation.

IN ANSWERING QUESTIONS 1-51 AND 1-52, REFER TO TABLES 15-1 AND 15-2 IN YOUR TEXTBOOK.

1-51. What was the GHA of the sun at zone time $09^h22^m14^s$ on 16 May 1986 in longitude 79°37′12"W?

1. 293°51.9′
2. 97°47.6′
3. 94°51.2′
4. 36°28.7′

1-52 What was the declination of the sun at the time and place in question 1-51?

1. S 8°59.2′
2. N 19°07.1′
3. N 19°07.9′
4. N 19°08.1′

1-53 What is the polar distance, measured from the elevated north pole of the celestial body whose declination is 20°S?

1. 20°
2. 70°
3. 110°
4. 200°

1-54 In a time diagram, the observer is located at what point?

1. Over the north celestial pole
2. On the celestial equator
3. On the Greenwich meridian
4. Over the south celestial pole

1-55. The GHA of a star is measured in what manner?

1. Counterclockwise from Greenwich to the star only
2. Clockwise from Greenwich to the star only
3. The same direction from Greenwich to the star
4. The same direction from the star to Greenwich

1-56. LHA is always measured from the local meridian in what direction?

1. Northward
2. Southward
3. Eastward
4. Westward

1-57. What method is used to obtain the LHA when the GHA and longitude are known?

1. Always add the longitude to the GHA
2. Always subtract the longitude from the GHA
3. Subtract an eastern longitude from the GHA and add a western longitude to the GHA
4. Add an eastern longitude to the GHA and subtract a western longitude from the GHA

1-58 What is the polar distance of a heavenly body?

1. The declination at that instant
2. 90° minus the declination
3. 180° minus the declination
4. 270° minus the declination

1-59 The difference between the surface-plane altitude value and the center-of-the-earth-plane altitude value is what type of correction?

1. Semidiameter
2. Refraction
3. Parallax
4. Upper limb

Learning Objective: Identify methods, procedures, and calculations required to determine latitude and azimuth.

1-60. To determine the true azimuth of a line, you must know which of the following data?

1. Longitude of the point from which the observation is made
2. Latitude of the point from which the observation is made
3. The polar distance
4. The meridian angle

1-61. An object is observed in the direction of the equator from the zenith of the observer's position. What is the latitude of the observer's position if the object's declination is S15°10′ and the corrected meridian altitude is 62°07′?

1. 17°32′
2. 28°42′
3. 36°22′
4. 43°03′

1-62. You are determining latitude by the altitude of the sun at noon. If the exact meridian is unknown, the vertical angle of the position of the sun is recorded when the sun

1. has crossed the line of sight
2. begins to cross the line of sight
3. is on a known meridian
4. reaches its zenith

1-63. If the transit used in determining latitude by altitude of the sun at noon is not equipped with solar attachment, what action should you take?

1. Use No.10 welder's glasses for sighting
2. Set the vertical cross hair tangent to the left edge of the sun's disk
3. Set the horizontal cross hair tangent to the lower edge of the sun's disk
4. Set the horizontal cross hair tangent to the upper edge of the sun's disk

1-64. What two methods are commonly used to determine an azimuth by sun observation?

1. Altitude and latitude
2. Altitude and longitude
3. Hour angle and longitude
4. Hour angle and altitude

1-65. Which of the following methods for determining an azimuth by sun observation is the fastest and most accurate?

1. Hour angle
2. Altitude
3. Latitude
4. Longitude

1-66. In what direction is the azimuth of the sun measured?

1. Clockwise from the meridian
2. Clockwise from the north
3. Counterclockwise from the meridian
4. Counterclockwise from the north

1-67. When you obtain the correct time from radio station WWV, what is the maximum correction you will make by counting the double ticks after the minute tone?

1. 1.0 second
2. 0.9 second
3. 0.7 second
4. 0.1 second

1-68. For a morning observation in the Western Hemisphere and an afternoon observation in the Eastern Hemisphere, Greenwich and local dates are NOT the same.

1. True
2. False

1-69. When you obtain a negative declination for the sun, what does this indicate?

1. An error in your calculations
2. The sun is east of the 0° meridian
3. The sun is north of the equator
4. The sun is south of the equator

1-70. What alternate method can be used to observe the sun with a telescope that does not have a special eyepiece or a lens filter?

1. Project the image onto a black piece of paper 1 foot behind the eyepiece
2. Project the image onto a black piece of paper 6 inches behind the eyepiece
3. Project the image onto a white piece of paper 1 foot behind the eyepiece
4. Project the image onto a white piece of paper 6 inches behind the eyepiece

1-71. By computing an azimuth for each sighting and averaging the azimuths, you eliminate what type of error?

1. Parallax
2. Instrument
3. Systematic
4. Human

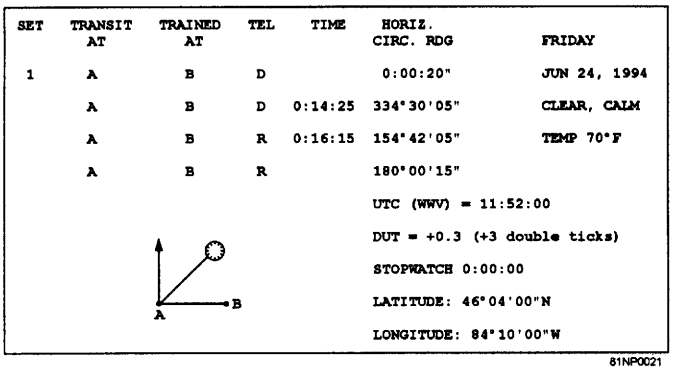


Figure 1A

IN ANSWERING QUESTIONS 1-72 AND 1-73, REFER TO FIGURE 1A.

1-72. What is the computed declination of the sun from the point of observation?

1. 25°24'35.5"
2. 23°25'13.7"
3. 23°25'15.7"
4. 23°25'51.7"

1-73. What is the azimuth of the line AB?

1. 17°58'18.4"
2. 77°56'13.7"
3. 103°04'53.7"
4. 167°56'35.2"

1-74. The Doppler positioning system works on what basis?

1. Counting radio waves
2. Constant changing radio frequency
3. Counting light waves
4. Measuring time intervals between beams of light

1-75. To determine a location with the GPS, you must know which of the following data?

1. Your position at the time of the reading
2. The satellites location at the time of observation
3. The distance from your position to the satellite
4. Each of the above

ASSIGNMENT 2

Textbook Assignment: "Field Astronomy and Triangulation." Pages 15-24 through 15-41. "Soils: Surveying and Exploration/Classification/Field Identification."Pages 16-1 through 16-4.

Learning Objective: Identify the principles and practices used in the triangulation method of surveying.

2-1. What is the major difference between traversing and triangulation?

1. Distances must be measured from each station in triangulation but not in traversing
2. Distances must be measured from each station in traversing but not in triangulation
3. Angles must be measured from each station in triangulation but not in traversing
4. Angles must be measured from each station in traversing but not in triangulation

2-2. What condition requires the triangulation method to be used?

1. When a high degree of precision is required
2. When EDMs are being used
3. When chaining is not possible due to terrain
4. When angles cannot be turned at each station due to obstructions

2-3. Which of the following duties should the party chief perform during a triangulation survey?

1. Head chainman
2. Rear chainman
3. Note keeper
4. Instrumentman

2-4. Who should perform the computations to determine horizontal locations of the points in the triangulation system?

1. Rear chainman
2. Instrumentman
3. Office personnel
4. Party chief

2-5. In a triangulation system, the beginning and ending distances are measured for what purpose?

1. To establish base lines for determining the distances of the other lines
2. To begin and close the triangulation net accurately
3. To establish base lines for checking the computed distances of the other lines
4. To provide the only distances required for the survey

2-6. What is one of the disadvantages of using the chain of single triangles?

1. Cannot be used for narrow areas
2. Provides no means of cross-checking computed distances
3. Cannot be used for inaccessible points
4. Requires the most calculations of any method

2-7. When discussing triangulation figures, to what does a chain of polygons refer?

1. A single chain of triangles
2. A chain of quadrilaterals
3. Both 1 and 2 above
4. A system of triangles forming a polygon

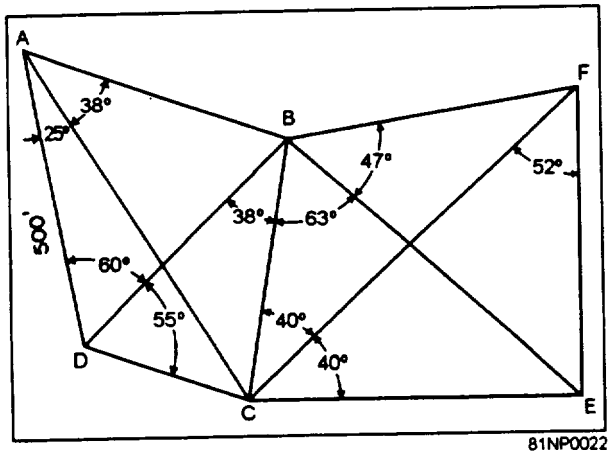


Figure 2A

IN ANSWERING QUESTIONS 2-8 THROUGH 2-11, USE THE CHAIN OF QUADRILATERALS IN FIGURE 2A AND THE TABLES IN APPENDIX II.

2-8. The size of the angle ABD is

1. 37°
2. 51°
3. 57°
4. 60°

2-9. What is the length of the line DB?

1. 500 ft
2. 531 ft
3. 548 ft
4. 554 ft

2-10. What is the length of line CE?

1. 646 ft
2. 608 ft
3. 697 ft
4. 709 ft

2-11. What is the length of line BF?

1. 452 ft
2. 487 ft
3. 520 ft
4. 561 ft

Learning Objective: Identify the construction and uses of various targets and signals as related to triangulation.

2-12. What minimum number of reference markers must be used for triangulation stations of first-order precision?

1. One
2. Two
3. Three
4. Four

2-13. What is the difference between a primary triangulation station and a secondary triangulation station?

1. The secondary station is used as a control point; the primary station is not
2. The secondary station is an instrument station; the primary station is not
3. The primary station is an instrument station; the secondary station is not
4. The primary stations are set up on monuments only; the secondary stations can use any point

2-14. A tripod target is the most satisfactory target to use because of which of the following qualities?

1. Its accuracy
2. Its durability
3. Its ease of construction
4. Each of the above

2-15. One of the disadvantages of using a bipod target is that it

1. is difficult to transport
2. must be strongly guyed
3. is extremely difficult to construct
4. cannot be used when first- or second-order precision is required

2-16. For accuracy, you should perform first- and second-order triangulation surveys (a) during what time of day and (b) using what type of signals?

1. (a) At night
   (b) signal lights
2. (a) At night
   (b) heliotropes
3. (a) In daylight
   (b) target sets
4. (a) In daylight, while overcast
   (b) nonilluminating bipod signals

Learning Objective: Identify the procedures used in triangulation surveying and recognize their importance.

2-17. Which of the following considerations must be made when selecting stations for triangulation?

1. Ease of signal erection
2. Size of the angles to be turned
3. Transit time between instrument setups
4. Direction of the sightings

2-18. After the stations have been selected and you begin to erect the towers, what must you consider regarding the targets?

1. How to light
2. The size
3. Color contrast of the target and background
4. Both 2 and 3 above

2-19. When you are using a 1-minute how many times must the angles be repeated to obtain third-order precision?

1. 20
2. 12
3. 3
4. 6

2-20. To compute the coordinates of triangulation stations, you must have what data?

1. Latitude and departure of the point of origin
2. The true meridian and azimuths for all lines
3. Latitude and departure of the lines between the stations
4. All of the above

2-21. You have measured a few tape intervals in a base line and the tape doesn't quite reach the metal strip on the buck. The head chainman measures the distance the chain must be set (a) in what direction? He then records this information in the field book and (b) takes what action concerning the measurement?

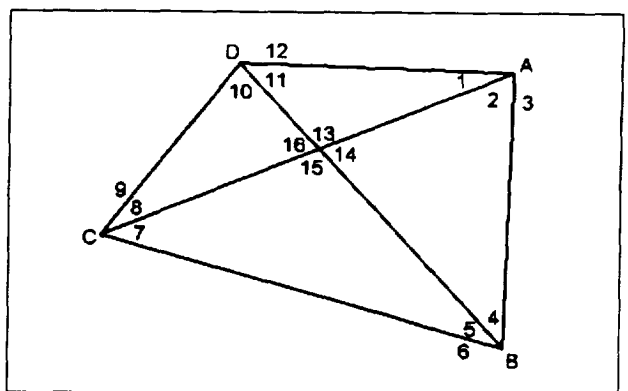
1. (a) Forward
   (b) adds the measurement to the tape length
2. (a) Forward
   (b) subtracts the measurement from the tape length
3. (a) Back
   (b) adds the measurement to the tape length
4. (a) Back
   (b) subtracts the measurement from the tape length

2-22. Figure adjustment uses what data for adjustment?

1. The sum of the exterior angles
2. The sum of the interior angles
3. The Pythagorean theory
4. The 360° theory

2-23. When adjusting a chain of triangles, what type of adjustment should you perform first?

1. Figure
2. Station
3. Side
4. Log-sine



ANGLE NO.	MEASURED VALUE	ANGLE NO.	MEASURED VALUE
1	30°57'05"	7	42°01'18"
2	61°07'50"	8	29°14'38"
3	267°54'59"	9	288°44'22"
4	38°28'37"	10	70°21'55"
5	38°22'22"	11	49°26'17"
6	238°09'10"	12	240°11'36"

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Figure 2B

IN ANSWERING QUESTIONS 2-24 THROUGH 2-28, USE THE QUADRILATERAL AND ANGLE VALUES SHOWN IN FIGURE 2B.

2-24. After point A is adjusted by the station adjustment method, what is the corrected value angle 1?

1. 30°59'07"
2. 30°59'05"
3. 30°57'08"
4. 30°57'07"

2-25. What correction must be applied to the station adjusted value of angle 5 for the first figure adjustment?

1. 00.00”
2. 00.25”
3. 00.50”
4. 01.00”

2-26. After the quadrilateral is figure adjusted for the first time, the value of angle 7 is

1. 42°00'00.0"
2. 42°01'12.0"
3. 42°01'12.5"
4. 42°07'12.5"

2-27. What pairs of angles equals the sum of angles 5 and 7?

1. 1 and 11
2. 2 and 4
3. 8 and 10
4. 6 and 12

2-28. What is the average triangle closure?

1. 01”
2. 02”
3. 03”
4. 04”

2-29. Which of the following factors are used to determine the precision of a triangulation survey?

1. The maximum angle size measured during the survey
2. The average triangle closure
3. The difference between any measured line and the computed value of that line
4. The average log-sine difference

2-30. The average triangle closure is checked at what point of your adjustments?

1. Before the station adjustment
2. After the first figure adjustment
3. After the second figure adjustment
4. After the station adjustment

A. $\frac{\log\sin 2 \times \log\sin 4 \times \log\sin 7 \times \log\sin 11}{\log\sin 1 \times \log\sin 5 \times \log\sin 8 \times \log\sin 10} = 1$

B. $(\log\sin 2 + \log\sin 4 + \log\sin 7 + \log\sin 11) - (\log\sin 1 + \log\sin 5 + \log\sin 8 + \log\sin 10) = 0$

C. $(\log\sin 1 + \log\sin 4 + \log\sin 7 + \log\sin 10) - (\log\sin 2 + \log\sin 5 + \log\sin 8 + \log\sin 11) = 0$

D. $(\log\sin 1 \times \log\sin 4 \times \log\sin 7 \times \log\sin 10) - (\log\sin 2 \times \log\sin 5 \times \log\sin 8 \times \log\sin 11) = 0$

Figure 2C

IN ANSWERING QUESTION 2-31, REFER TO FIGURE 2C.

2-31. Which equation, from figure 2C, properly represents the log-sine relations of the angles?

1. A
2. B
3. C
4. D

2-32. You have computed the length of a line in two ways by solving the appropriate triangles. Which, if any, of the following values should you select for the line?

1. The larger value
2. The smaller value
3. The average of the two values
4. None of the above, you must rerun the survey to obtain the same value each way

2-33. What is the desired results of a triangulation survey?

1. To determine the area of the property surveyed
2. To determine the horizontal location of points by bearing and distance
3. To determine vertical location of points by bearing, distance, and elevation
4. To determine the equipment error for future maintenance

2-34. When you have the coordinates of a monument, how do you determine the coordinates of the triangulation points?

1. By measuring the bearing and distance to your starting point
2. By measuring the bearing and distance to all points
3. By measuring the bearing to your starting point
4. By measuring the distance to your starting point

Learning Objective: Identify the purpose, methods, and requirements of geological and pedological surveys.

2-35. The purpose of a geological survey is to obtain which of the following data?

1. To locate rock formations in the field and determine their physical characteristics
2. To determine rock age and distribution
3. To determine the types of rocks and their mineral content
4. All of the above

2-36. How can a geologist determine the approximate age of a rock formation?

1. By examining the sequence of rock units
2. From data obtained by seismic surveys
3. By the presence of certain organic particles
4. From data obtained by nuclear density surveys

2-37. Which of the following survey methods might a geologist use in plotting features on a field map?

1. Reference an outcrop to a relief feature
2. Reference an outcrop by establishing direction with a compass
3. Measure the difference in elevation with an altimeter
4. Each of the above

2-38. The surveyor supports the geologist by performing which of the following tasks?

1. By examining the borehole samples
2. By plotting the results of the geological surveys
3. By preparing the basic topographic map
4. Both 2 and 3 above

2-39. To establish your base direction, you should take which of the following steps?

1. Perform a triangulation survey
2. Run a control traverse
3. Begin from an established monument
4. Use an established base line from a triangulation net

2-40. Distance measurements should be obtained as accurately as possible for a base map survey.

1. True
2. False

2-41. Measurements made by stadia during a geological survey must be accurate to 1 part in

1. 200
2. 300
3. 500
4. 1,000

2-42. What is the maximum allowable error in elevation when plotting data for a geological map?

1. One half of the contour interval
2. One contour interval
3. Two contour intervals
4. 25 feet

2-43. Horizontal angles, other than traverse angles, that are plotted on a geological topography map should be read to the nearest

1. 1 minute
2. 15 minutes
3. 30 minutes
4. 1 degree

2-44. Aerial photographs may be used in place of a base map that will be used for engineering purposes.

1. True
2. False

2-45. Which of the following topographic features are more clearly shown on aerial photographic maps?

1. Intermittent streams
2. Sinkholes
3. Abrupt contour changes
4. Heavily wooded swamp areas

2-46. The plotted elevations of the intersection of core borings and the surface of the earth should be accurate to the nearest

1. 0.1 ft
2. 0.5 ft
3. 1.0 ft
4. 5.0 ft

2-47. Geological surveys should conform to what degree of precision?

1. First order
2. Second order
3. Third order
4. Fourth order

2-48. What type of drawing is prepared for a pedological survey?

1. Mosaic
2. Base map
3. Plan and profile
4. Preliminary survey map

2-49. Pedological surveys should conform to what degree of precision?

1. Low order
2. Second order
3. Third order
4. Fourth order

2-50. In the absence of known bases, what should be used for the established base direction?

1. Railroad tracks
2. Magnetic north
3. Highway center lines
4. True north

2-51. To reduce the time of the survey, you should measure distances in what manner?

1. Pacing
2. Rough chaining
3. Stadia
4. EDM

2-52. When you are not given specific instructions for the preparation of sketches of the pedological survey, what scale should you use?

1. 1 in. = 200 ft
2. 1 in. = 300 ft
3. 1 in. = 400 ft
4. 1 in. = 500 ft

ASSIGNMENT 3

Textbook Assignment: "Soils: Surveying and Exploration/Classification/Field Identification." Pages 16-4 through 16-23.

Learning Objective: Identify the purpose of soil exploration. Identify reference sources and their uses in planning soil exploration.

3-1. Soil surveys of a proposed construction site provide which of the following information about the soil conditions of that site?

1. The condition of the soil layers
2. The drainage characteristics
3. The source of possible construction materials
4. All of the above

3-2. Which of the following types of soil has better internal drainage?

1. Well-graded gravel
2. Inorganic clay
3. Silty sand
4. Organic clay

3-3. When you discover that a proposed grade line is below the groundwater table, which of the following actions must be taken?

1. Change the location
2. Lower the grade line
3. Lower the water table by mechanical means
4. Install a water barrier during the construction

3-4. At what time interval should the measurement for the groundwater table be taken in a test hole?

1. As soon as water is located
2. At high tide
3. 24 hours after the hole is bored
4. 36 hours after the highest water level is reached

3-5. A soil profile provides which of the following information?

1. Location of ledge rock
2. Location of the water table
3. Identification of the soil layers
4. All of the above

3-6. The soil profile does NOT provide information that is useful in determining the finished grade location.

1. True
2. False

3-7. Which of the following sources of information would provide you with a location of construction materials, as well as locations of sand and gravel pits?

1. Intelligence reports
2. Topographic maps
3. Agricultural maps
4. Geologic maps

3-8. An agricultural soils map provides a variety of information on soils to what maximum depth?

1. 72 inches
2. 36 inches
3. 12 inches
4. 6 inches

3-9. When reviewing aerial photographs, you observe areas with smoothly rounded slopes. What type of soil does this indicate?

1. Granular
2. Plastic
3. Bedrock
4. Silt deposits

3-10. When reviewing aerial photographs, you notice a drainage area. What is indicated by a sudden change in grade or direction of that drainage area in the photograph?

1. Diversion ditches
2. Rock formations
3. Sand deposits
4. All of the above

3-11. With proper study of maps and photographs, there should be no need for any field investigation.

1. True
2. False

3-12. Which of the following requirements is true of a test pit excavation?

1. Must be large enough for a man to enter
2. Must be made with power-driven equipment
3. Must be below the water table
4. Load-bearing tests must be performed on soil samples taken every 18 inches

3-13. Test holes are best performed on what type of soil?

1. Cohesiveless soil below the water table
2. Cohesiveless soil above the water table with large aggregate
3. Cohesive soil
4. Bedrock

3-14. Soil samples obtained by digging test holes are used for which of the following test purposes?

1. Soil classification
2. Compaction
3. Moisture Content
4. Each of the above

3-15. What method is commonly used commercially to make deep test holes?

1. Wash boring
2. Core boring
3. Drilling
4. Auger boring

3-16. Undisturbed samples are used to test which of the following qualities of the soil?

1. Saturation point
2. Cohesiveness
3. Shear strength
4. Load-bearing strength

3-17. You must determine subgrade conditions for construction of a new road. What is the next step once the field reconnaissance has been completed?

1. Develop soil profiles
2. Classify the soil
3. Obtain samples for laboratory testing
4. Perform preliminary borings at appropriate locations

3-18. When performing soils investigation on possible borrow areas, you should make borings to what depth?

1. 10 feet
2. The depth of planned excavation
3. 2 - 4 feet below anticipated excavation
4. Same depth as all other borings

3-19. When performing soils surveys, which of the following sources should you use to obtain information pertinent to the area?

1. Local contractors
2. Existing mine shafts of earth cellars
3. Eroded slopes
4. All of the above

3-20. Detailed soil explorations should be performed at what type of site?

1. Proposed center line
2. Proposed large cut location
3. Extreme grade shift
4. Proposed pavement location

3-21. What minimum spacing, if any, is required between boring holes?

1. 25 feet
2. 50 feet
3. 100 feet
4. None

Learning Objective: Identify the classification of soils according to the Unified Soil Classification System and solve mathematical problems related to soil classification.

3-22. Highly organic soil is identified by what manner?

1. More than 50 percent passing a No. 200 sieve
2. 50 percent or more retained on a No. 200 sieve
3. Determining that the sample is neither a fine-grained nor coarse-grained soil
4. Visual inspection

3-23. The Unified Soil Classification System uses what number of groups for soil classification?

1. Five
2. Seven
3. Fifteen
4. Thirty

3-24. Coars-grained sils are divided into what divisions?

1. Silt and sand
2. Clay and gravel
3. Sand and gravel
4. Clay and silt

3-25. To classify a coarse-grained soil, you would use what sieve?

1. 1/4 inch
2. No. 4
3. No. 50
4. No. 200

3-26. Coarse-grained soils with more than 12-percent fines are classified by what characteristic(s)?

1. Cohesiveness
2. Liquid limit
3. Plasticity index
4. Both 2 and 3 above

3-27. For a soil sample to be classified as silty gravel, the plasticity index should be

1. more than 7
2. between 4 and 7
3. less than 4
4. unmeasurable

3-28. Coarse-grained soils with between 5- and 12-percent fines are classified in what manner?

1. By dual symbols
2. As clayey silts
3. As nonplastic, nonliquid soils
4. As silty clays

3-29. A borderline soil may meet more than one zone requirement.

1. True
2. False

3-30. Fine-grained soils are classified based on what requirement?

1. Plasticity index
2. Grain-size distribution
3. Percentage of organic material
4. Liquid limit

3-31. Plastic silts have what group designation?

1. MH
2. ML
3. MP
4. MW

3-32. Peat is identified in what manner?

1. By grain-size distribution
2. By liquid limit determination
3. By odor
4. By plasticity index determination

3-33. C_c is defined as the coefficient of

1. uniformity of the grain-size curve
2. gradation
3. curvature of the gradation curve
4. distribution

3-34. To determine the coefficient of uniformity, you must have what information?

1. Percent retained on the No. 10 and No. 60 sieves
2. Percent passing the No. 10 and No. 60 sieves
3. Grain size, in centimeters, at 10- and 60-percent passing levels on the gradation curve
4. Grain size, in millimeters, at 10- and 60-percent passing levels on the gradation curve

YOU HAVE COMPLETED A SIEVE ANALYSIS WITH THE FOLLOWING RESULTS:

SIEVE SIZE	PERCENT PASSING
1/2 IN.	100
1 IN.	74
3/4 IN.	57
1/2 IN.	40
NO. 4	27
NO. 10	22
NO. 40	14
NO. 60	8
NO. 100	5
NO. 200	3.8

Figure 3A

IN ANSWERING QUESTIONS 3-35 THROUGH 3-39, USE THE INFORMATION FROM FIGURE 3A.

3-35. What is the value of D_{60} for this soil sample?

1. 7.2 mm
2. 20.0 mm
3. 29.6 mm
4. 37.3 mm

3-36. What is the coefficient of uniformity (C_U) of this soil sample?

1. 18.1
2. 32.7
3. 48.9
4. 66.7

3-37 What is the value for D_{30} for this soil sample?

1. 3.0
2. 4.8
3. 5.6
4. 6.2

3-38 What is the coefficient of curvature (C_c) of this soil sample?

1. 5.6
2. 12.7
3. 21.9
4. 52.0

3-39 What is the classification of this soil sample?

1. GW
2. GP
3. SW
4. SP

Learning Objective: Identify the test procedures used in the field to identify soil characteristics.

3-40. Why is it also necessary to perform field identification tests on soils even when laboratory tests are required during soil explorations?

1. To determine which laboratory tests will be omitted
2. To minimize the duplication of laboratory tests samples
3. To provide duplicate results for positive identification
4. To ensure there are no errors in the laboratory tests

3-41. What is the best way to gain the necessary skills required for field testing?

1. By working with experienced technicians
2. By receiving formal soils training
3. By getting the “feel” of the soil during the laboratory tests

3-42. What is the most useful tool for performing field identification tests?

1. A hand auger
2. A scale or balance
3. A No. 40 sieve
4. A No. 200 sieve

3-43. When identifying soils in the field, which of the soil properties should you include in the description of the soil?

1. Color
2. Percentage of sand
3. Maximum particle Size
4. Particle shape

3-44. Visual examination is used to establish which of the following properties of the soil?

1. Color
2. Grain distribution
3. Cohesiveness of the soil
4. Grain shape of the fines

3-45. When the color of a soil has been identified through a visual examination, what other data should you note regarding the soil condition at the time of identification?

1. Temperature
2. Maximum particle size
3. Chemical content
4. Moisture content

3-46. During visual examination of a soil sample, you notice a yellow color. What can you conclude about the soil from this observation?

1. Organic material is present
2. Iron oxides are present
3. The soil has poor drainage capabilities
4. Aluminum compounds are present

3-47. What is the first step in approximating grain-size distribution in field identification?

1. Separating the larger particles
2. Examining the coarse-grained soil for gradation distribution
3. Estimating the percentage of fine-grained soil
4. Performing the sieve sampling

3-48. You have determined the soil to be coarse-grained and estimated the fines to be 4 percent. What is the soil classification of the soil?

1. GW-GM
2. SW-SM
3. GC
4. Gravel or sand, depending on additional information

3-49. Which of the following field tests can be used to determine the cohesiveness of a soil?

1. Ribbon
2. Roll
3. Breaking
4. Each of the above

3-50. The breaking, ribbon, and wet-shaking tests are performed on material passing the

1. No. 40 sieve
2. No. 60 sieve
3. No. 100 sieve
4. No. 200 sieve

3-51. You have performed the dry-strength test. The sample cannot be powdered but will break with difficulty. What is the classification of the soil?

1. CL
2. CH
3. ML
4. MH

3-52. What tests complement each other in giving a clearer picture of the plasticity of the soil?

1. Wet shaking and roll
2. Ribbon and breaking
3. Roll and ribbon
4. Wet shaking and breaking

3-53. What is the size of the sample used for the wet-shaking test?

1. A roll of soil 1/2 inch in diameter and 3 inches long
2. A pat of soil 1/2 inch thick and 1 1/2 inches in diameter
3. A ball of soil 3/4 inch in diameter
4. A ball of soil 1 3/4 inches in diameter

3-54. A mall amount of clay present in your sample will affect your shaking test in what manner?

1. Causes no reaction
2. Causes a sudden reaction
3. Retards the reaction
4. Assists in identifying the sands and silts

3-55. The odor test is effective in identifying what type of soils?

1. Organic
2. Cohesive
3. Clayey
4. Oily

3-56. What field test can readily identify soil as containing sand, silts, or clay?

1. Acid
2. Feel
3. Bite
4. Shine

3-57. To prevent a false test result when performing the acid test, you should prepare your sample in what manner?

1. By heating
2. By wet-sieve washing
3. By adding moisture
4. By adding lime

3-58. A positive result of the shine test indicates the

1. lack of clay in the soil
2. presence of highly plastic clay
3. presence of peat
4. lack of plasticity of the sample

3-59. To determine the texture of the soil, it is recommended you rub the soil

1. on the back of your hand and allow the sample to dry
2. on a tender skin area, such as the wrist
3. between dry fingers
4. between slightly oiled fingers

ASSIGNMENT 4

Textbook Assignment: "Mix Design: Concrete and asphalt." Pages 17-1 through 17-22. "Soil Stabilization." Pages 18-1 through 18-9.

Learning Objective: Identify the methods and procedures used in the design of concrete mixtures.

4-1. Concrete mixture proportions are determined by which of the following factors?

1. Anticipated weather conditions at the time of placement
2. Anticipated weather conditions during the entire curing process
3. Size and shape of the structure
4. Quantity to be placed

4-2. What factor determines the strenqth and durability of the concrete?

1. Volume of water
2. Volume of cement
3. Water-cement ratio
4. Compressive strength

4-3. When considering the exposure conditions and strength requirements using tables 17-1 and 17-2, what water-cement ratio should you use?

1. Higher ratio
2. Lower ratio
3. Average of the appropriate ratios
4. Laboratory obtained ratio

4-4. A concrete wall is 10 inches thick. What is the maximum size of the coarse aggregate that can be used in the mix?

1. 2.0 in
2. 3.5 in
3. 5.0 in
4. 7.5 in

4-5. Fine aggregate is used in a mix for which of the following purposes?

1. To increase the strength of the mix
2. To absorb excess water
3. To increase the workability of the mix
4. To accelerate the hydration process

4-6. Regardless of weather conditions, entrained air should always be used in concrete for which of the following purposes?

1. Precast
2. Paving
3. Drainage
4. Foundation

4-7. Concrete that is exposed to moisture or free water before freezing is classified as what type of exposure?

1. Mild
2. Moderate
3. Severe
4. Harsh

4-8. What method measures the consistency of the concrete mix?

1. Trial batch
2. Workability test
3. Proportions and ratio
4. Slump test

4-9. The size of your trial batch should be determined by which of the following factors?

1. Size of the placement
2. Equipment available for placement
3. Number of test samples required
4. Size of the coarse aggregate

4-10. The aggregates for your test batch should be in what condition?

1. Oven-dried
2. Saturated, surface-dry
3. Saturated
4. Super saturated

4-11. To determine the amount of mixing water needed for a trial batch, you must determine which of the following information?

1. Amount of cement required
2. Water-cement ratio
3. Desired slump
4. All of the above

4-12. Your coarse aggregate has a maximum size of 2 inches and a fineness modulus of 3.00. What quantity of coarse aggregate is required for a 1-cubic-yard trial batch?

1. 1,944 lb
2. 2,000 lb
3. 19.44 cu ft
4. 20.00 cu ft

4-13. You are preparing a l-cubic-foot trial batch with a water-cement ratio of 0.50. The quantity of cement to be used is 23.5 pounds. What is the required quantity of water?

1. 23.50 lb
2. 11.75 lb
3. 0.50 cu ft
4. 0.25 cU ft

4-14. You mix a 1-cubic-yard trial batch and the slump is 2 inches more than the desired slump. What action must you take?

1. Add 10 gal of water
2. Decrease your water by 10 lb
3. Decrease your water by 20 lb
4. Add more cement

4-15. To determine the absolute volume of coarse aggregate, which of the following information do you require?

1. Maximum aggregate size
2. Specific gravity
3. Dry-rodded weight
4. All of the above

4-16. When the fineness modulus is not in the tables, what must you do to determine the volume for the coarse aggregate?

1. Use the value that is higher than the aggregate
2. Use the value that is lower than the aggregate
3. Use the average value from the tables
4. Interpolate to obtain the value

4-17. How do you determine the absolute volume of fine aggregate?

1. (Percents of fine aggregate) x (total cement)
2. 27 - (Total absolute volume of all other materials)
3. (Absolute volume of coarse aggregatea)-(absolute volume of concrete)
4. (Total volume of all material) x (specific gravity of fines) x 62.4

4-18. What is the percentage of free-surface moisture in sand that is squeezed and clings together but contains no excess water?

1. 0% to 2%
2. 2% to 4%
3. 5% to 8%
4. 8% to 12%

4-19. What is the maximum FSM of gravel?

1. 1%
2. 2%
3. 3%
4. 4%

4-20. When you are batching the concrete mix by weight, how do you account for the weight contributed by the FSM?

1. Increase the total weight for the coarse aggregate only by the FSM
2. Decrease the total weight for the fine aggregate only by the FSM
3. Increase the total weight for the aggregates per cubic yard by the FSM
4. Decrease the total weight for the aggregates by the FSM

4-21. What adjustment, if any, should be made to water requirements to account for FSM of the aggregates?

1. Increase the amount of water by the FSM
2. Decrease the amount of water by the FSM
3. Decrease the amount of water by the FSM of the fine aggregates only
4. None

4-22. The FA has a 4 percent FSM and the CA has a 2 percent FSM. The original mix design called for the FA to be 1,050 pounds per cubic yard. What is the adjusted weight of the FA for the actual concrete mix?

1. 1,008 lb/cu yd
2. 1,050 lb/cu yd
3. 1,092 lb/cu yd
4. 1,113 lb/cu yd

4-23. You should monitor the moisture content of the aggregates and make appropriate adjustments under which of the following conditions?

1. After periods of dryness
2. After rains
3. After new material is delivered
4. All of the above

4-24. What waste factor, if any, should be applied to a concrete estimate of 220 cubic yards?

1. 5%
2. 10%
3. 15%
4. None

4-25. Determine the total number of sacks of cement required for a design project that uses a total volume of 180 cubic yard of concrete? (Use 6.5 sacks per cubic yard.)

1. 1,000
2. 1,170
3. 1,240
4. 1,287

Learning Objective: Identify methods and procedures used in the design of bituminous mixtures.

4-26. The objective of bituminous mix design is to determine which of the following factors?

1. The most durable mix possible
2. The most workable mix
3. The most economical blend that will meet all specified requirements
4. The most stable mix with the ability to withstand all possible traffic loads

4-27. The aggregate blend must achieve a specified gradation. Your trial batches are based on selected percentages from what source?

1. Project specifications
2. TM 5-337
3. NAVFAC MO-330
4. U. S. Army Corps of Engineers Pavement Design Manual

4-28. The specification limits for the gradation blend are established by what authority or publication?

1. By project specifications
2. By TM 5-337
3. By NAVFAC MO-330
4. U. S. Army Corps of Engineers

4-29. The final bitumen mix design is affected by all of the following variables except the

1. use of mix
2. minimum aggregate size
3. binder
4. loading

4-30. Which of the following data is required to prepare the test specimens?

1. Flow
2. Percentage of voids
3. Specific gravity of the aggregates
4. Total mix unit weight

IN ANSWERING QUESTION 4-31, REFER TO TABLE 17-7 IN YOUR TEXTBOOK.

4-31 What flow rate is acceptable for a surface course that serves as a high-pressure tire pavement?

1. 16 or less
2. 20 or less
3. 2% - 4%
4. 5% - 7%

4-32 When verifying the test results with the criteria for a particular property, you should use the OAC from that particular test only.

1. True
2. False

4-33 The Marshall test method requires no special modification until the 1-inch plus aggregate exceeds what percentage of the total aggregate?

1. 5%
2. 7%
3. 10%
4. 12%

4-34. You have determined the optimum bitumen content to be 5.5 percent. The aggregate will be what percentage of the mix?

1. 100.0%
2. 97.8%
3. 94.5%
4. 89.0%

4-35. When you perform the tests for cold-mix asphalts, what is the maximum moisture content of the aggregate by weight?

1. 1%
2. 2%
3. 5%
4. 7%

Learning Objective: Identify the general methods of soil stabilization.

4-36. Which of the following methods is a general method used for soil stabilization?

1. Modification
2. Additive
3. Cementing
4. Bituminous

4-37. The method of soil stabilization to be used is determined by which of the following factors?

1. Soil description
2. Soil classification
3. Amount of required stabilization
4. Each of the above

4-38. The mechanical method of soil stabilization is accomplished by mixing what materials?

1. Soils of different gradations
2. Cement and soil
3. Bituminous products and soil
4. Each of the above

4-39. Additives are used for what primary purpose?

1. To improve soil strength only
2. To improve soil durability only
3. To reduce the thickness required only
4. To improve soil quality

4-40. When stabilization is achieved by cementing, the final strength depends on which of the following factors?

1. Amount of cement used
2. Density achieved during curing
3. Density achieved during compaction
4. Both 2 and 3 above

Learning Objective: Identify types of stabilizers and the methods used for determining the type and the amount of stabilizer required.

4-41. Which of the following tests must be performed before a stabilizer can be selected?

1. Moisture content
2. Sieve analysis
3. Specific gravity
4. Bearing tests

4-42. Cement can be used with coarse-grained soils that meet what criteria?

1. At least 45% retained on a No. 4 sieve
2. At least 45% passing a No. 4 sieve
3. At least 45% retained on a No. 40 sieve
4. At least 45% passing a No. 40 sieve

4-43. Plasticity index should meet what criteria when you use a bituminous material for soil stabilization?

1. Greater than 30
2. Less than 30 but greater than 10
3. Equal to 25
4. Less than 10

4-44. When you choose a stabilizer additive, which of the following factors must be considered?

1. Environmental conditions
2. Cost
3. Type of soil quality improvement desired
4. Each of the above

4-45. Plastic soil-cement is used for which of the following purposes?

1. Road repairs
2. Erosion prevention
3. Paving ditches
4. Each of the above

4-46. When you add cement to the soil, which of the following properties increases ?

1. Plasticity
2. Water-holding capacity
3. All properties
4. Bearing capacity

4-47. Water is used in soil-cement for what purpose?

1. For hydration of the cement
2. To obtain maximum compaction
3. Both 1 and 2 above
4. To increase the weight

4-48. Soils used for soil-cement must be well graded to provide proper aggregate cohesion.

1. True
2. False

4-49. Which of the following soils is the most desirable for soil-cement construction?

1. Silty and clayey soil that contains a relatively high percentage of clay
2. Sandy soil that is deficient in fines
3. Sandy and gravelly soil with more than 55% passing a No. 4 sieve
4. Sandy and gravelly soil that contains 10% to 35% silt and clay

4-50. What is the first requirement for quality soil-cement?

1. Proper moisture content
2. Adequate cement content
3. Density of the soil
4. Proper compacting equipment

4-51. When you perform laboratory tests, composite samples should not be used because they could provide misleading and inaccurate results.

1. True
2. False

4-52. The required cement content for nonfrost areas is determined by which of the following tests?

1. Moisture-density
2. Freeze-thaw
3. Wet-dry
4. Both 2 and 3 above

4-53. The wet-dry test takes approximately how long to complete?

1. 1 day
2. 2 days
3. 24 days
4. 108 days

4-54. Your sample is classified as a gravelly soil. What is the passing criteria for this type of soil when the freeze-thaw test has been performed on the sample?

1. At least 7% weight loss
2. Not more than 7% weight loss
3. At least 14% weight loss
4. Not more than 14% weight loss

4-55. The principle requirement of a soil-cement mixture is to withstand exposure to the weather. By meeting this requirement, another requirement is also met. What is that other requirement?

1. Strength
2. Moisture content
3. Plasticity

4-56. The use of bitumen has which of the following effects on the soil?

1. Decreases the load-bearing capacity
2. Decreases cohesion
3. Increases the resistant to water action
4. Each of the above

4-57. In frost areas, tar is the recommended bituminous binder.

1. True
2. False

4-58. When pollution control concerns exist, what type of bituminous product is recommended?

1. Asphalt cement
2. Asphalt emulsion
3. Tar
4. Cutback asphalt

4-59. For a well-graded aggregate with little to no mineral filler, which of the following bituminous materials should you use?

1. MC-3000
2. MC-250
3. SS-1h
4. SC-70

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